FIELD MUSEUM

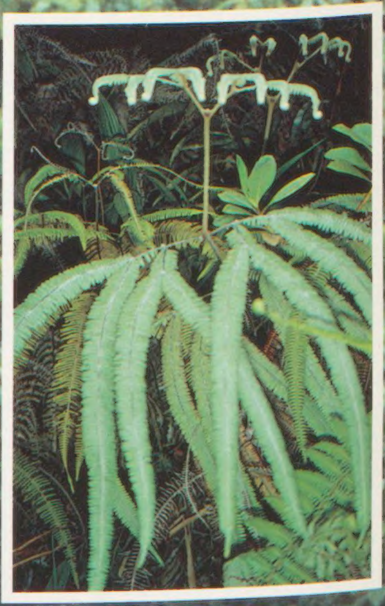
OF NATURAL HISTORY

PERSPECTIVES 1993

The two main functions of the Field Museum — scientific research and the dissemination of knowledge through exhibits — have been constant throughout our hundred-year history, but the ways in which we approach those tasks are constantly changing. Exhibit presentations change because new scientific evidence and theoretical concepts make them outdated and because changing technology and lifestyles necessitate new educational strategies. Scientific research changes because new tools become available, new questions take priority, and curators develop new interests.

In this report, we highlight the work of a spectrum of curators and the latest offerings from our imaginative cadre of exhibit developers. They work in varied discipines, but all of them have in common our institutional mission of collection-based research and learning about the diversity and relationships in nature and among human cultures. Approaching our Centennial celebrations, we are determined to continue in our second century the tradition of dynamic change that has marked the Museum's first hundred years.

Willard L. Boyd
President



A SPECIES OF GLEICHENIA, A PRIMITIVE AND DISTINCTIVE GENUS OF FERNS, IN A WOODED RAVINE NEAR MALDONADO. CARCHI PROVINCE, NORTHWESTERN ECUADOR.

Photos by Sue Stolze

CYATHEA TREE FERNS AT THE EDGE OF A THICKLY WOODED RAVINE, A TYPICALLY PRODUCTIVE SITE FOR COLLECTION OF PTERIDOPHYTES, NEAR PUYO, PASTAZA PROVINCE, EASTERN ECUADOR.

AN INTIMATE FAMILIARITY WITH FERNS

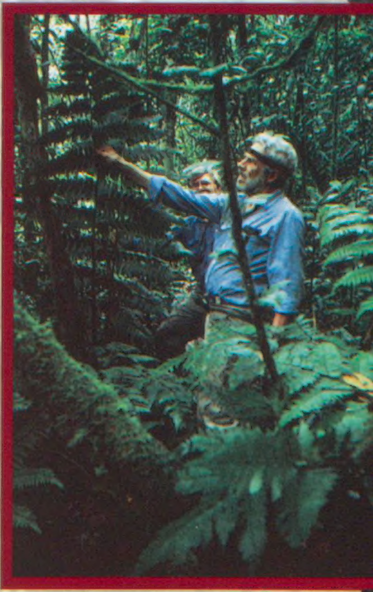
As associate curator of pteridophytes — the ferns and allied spore-bearing plants — at the Field Museum, Robert G. Stolze presides over the country's fourth-largest collection, more than 120,000 specimens. "Four of the major divisions of plants are pteridophytes," he notes. "They represent ancient evolutionary lines that provide a link between the oldest algae and the more recent angiosperms [flowering plants], and we don't know enough about them. In Ecuador, studying a well-known genus in a well-collected country, I still found five new species."

Stolze's recent major work has dealt with complete descriptions of the pteridophytes of Guatemala (which took ten years) and of Peru (now nearing completion after six years). Such meticulous work not only provides a foundation for other studies in disciplines as diverse as medicine and evolutionary theory, but provides the scientific underpinning of efforts to preserve biological diversity. There are some 12,000 species of pteridophytes; only someone like Stolze, thoroughly familiar with major museum collections, can quickly note that certain species are no longer showing up in new collections and advise conservation officials where the trouble spots are and what kinds of habitats are in need of protection. Right now, Stolze says, there's a major problem with tree ferns: Trunk sections of some species afford an excellent growing medium for orchids, and others are used by farmers as fenceposts because they're resistant to rot and insects. As economic development accelerates, the demand for tree-fern trunks increases while their habitats are being overrun.

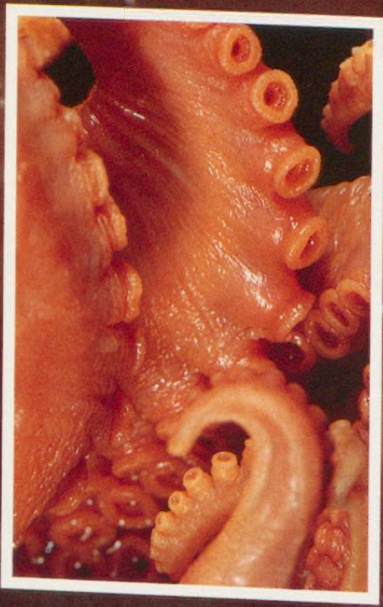
CASCADA SAN RAFAEL, LARGEST WATERFALL IN THE COUNTRY, PROVIDES A SPECTACULAR BACKGROUND FOR PTERIDOPHYTE COLLECTING IN AN ADJACENT FOREST. SUCUMBIOS PROVINCE, EASTERN ECUADOR.

On the verge of retirement, Stolze retains a boyish enthusiasm for his field. Floristics, the kind of geographical survey work in which he specializes, is a demanding discipline but, he says, "The neat thing about it is that I'm probably intimately familiar with several thousand species of ferns, and fairly familiar with two-thirds of them." Such broad-based expertise is needed now more than ever as the conservation of tropical habitats is an increasing international priority.

Stolze himself is something of an endangered species. He has a bachelor's degree in business administration from Notre Dame, and his expertise in botany is substantially the result of his work in the Field Museum since 1963, when he started as a part-time collections assistant. He was hired the following year as herbarium assistant in ferns and over the next 25 years, with Rolla Tryon of Harvard University's Gray Herbarium as mentor and colleague, Stolze became one of the world's leading authorities on the systematics (the identification and classification) of New World tropical ferns. Along the way he published the monumental *Pteridophyta of Guatemala* and *Pteridophyta of Peru*. And in 1989, despite his lack of a Ph.D., he was appointed associate curator — the first such person in at least twenty years so recognized.



ROBERT STOLZE AND FELLOW PTERIDOLOGIST BENJAMIN OLLGAARD DISCOVER A NEW FERN, DIPLAZIUM IMMENSUM, BETWEEN GUALAQUIZA AND MACAS, MORONA-SANTIAGO PROVINCE, SOUTHERN ECUADOR.



John Weinstein

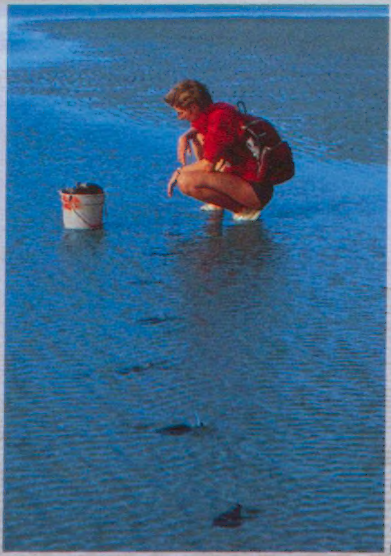
The suckers on the arms of a preserved specimen of *Pareledone charcoti*, an Antarctic octopus. This species lives at depths of 18–595 meters (60 to 1900 feet).

The suckers on the arms of a preserved specimen of *Octopus bimaculatus*. The species lives in the eastern Pacific Ocean and the northern Gulf of California. This specimen was collected from a rocky area at Puerto Penasco, Sonora, Mexico, in the intertidal zone.

Photo by John Weinstein

UNTANGLING THE OCTOPUSES

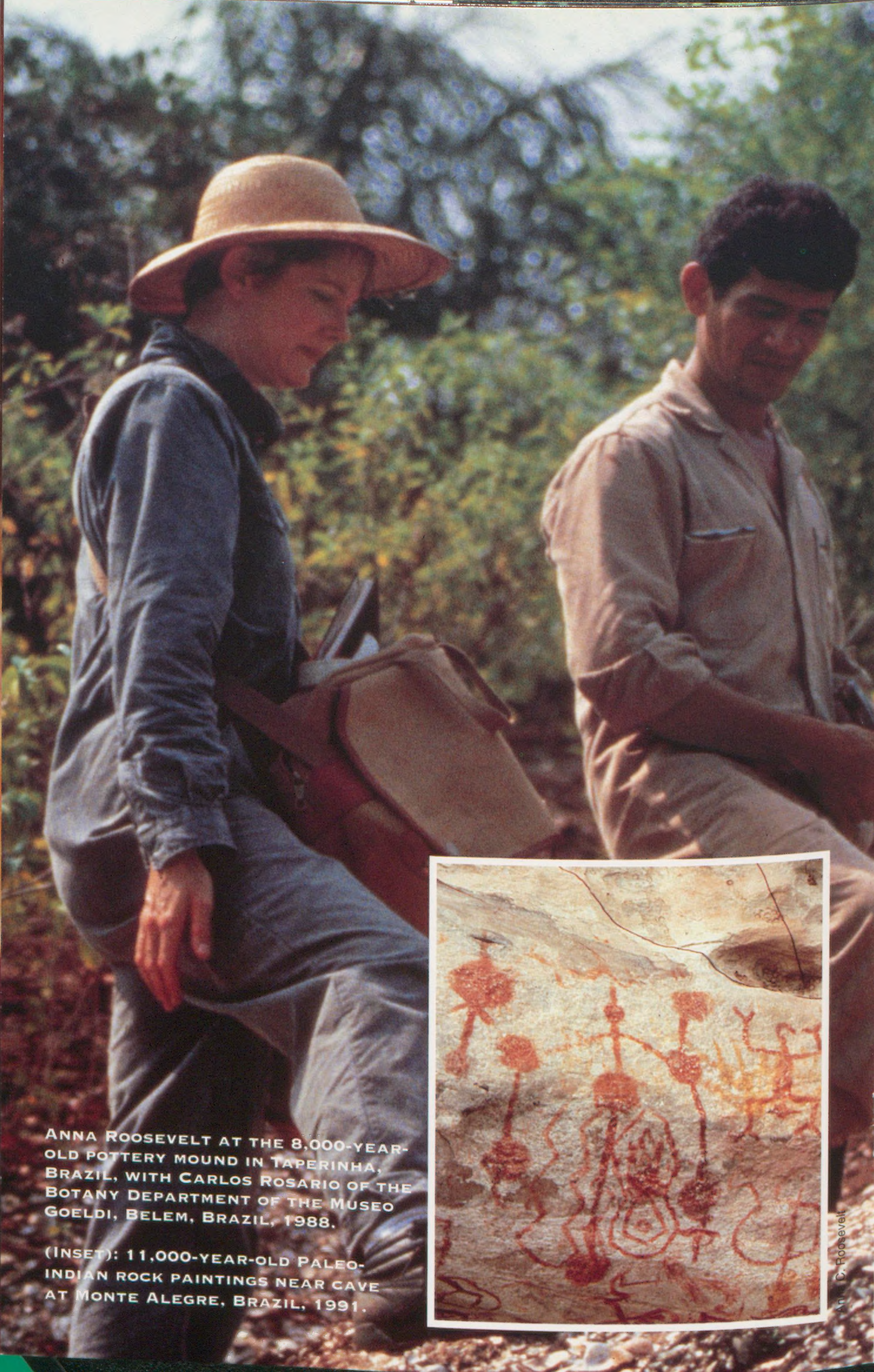
Research about octopuses has always been hampered because they are difficult to observe in the wild; they have short life spans; and they do not do well in captivity. Worse, it's easier to study the species of octopuses that live in coastal areas than it is to study open-ocean and deep-sea species, with the result that we may really know even less about the group as a whole than we think we do.


Robert Smith

JANET VOIGHT AT CHOLLA BAY, SONORA, MEXICO ON AN INTERTIDAL SANDFLAT AT LOW TIDE, INSPECTING A ROW OF BEER BOTTLES SHE SET EARLIER TO CAPTURE *OCTOPUS DIGUETI*.

Janet Voight, assistant curator of invertebrates, has sought to overcome these limitations by devising novel strategies of investigation. In one legendary foray while still a graduate student, Voight seeded an intertidal zone of the Gulf of California with the equivalent of an octopus Levittown — 150 Corona beer bottles. The brown bottle was just the sort of shelter the Pacific sand-flat octopus (*Octopus digueti*) favors, with a narrow opening and a roomy, dark interior, and Voight was able to collect more than 800 octopuses, presumably a representative population sample. She found that individuals of the species vary considerably in size and weight, with females ranging from 11 grams to 75 grams while they were brooding eggs. Larger females produce more eggs, but are too large for most of the available shelters (mainly clam and snail shells) and so are more vulnerable to predators. The extreme range of variation, Voight concluded, enables the species as a whole to survive whether the local environment favors large animals or small ones. Given that almost all modern cephalopods (squids and octopuses) share the "big bang" reproductive pattern of females producing only one clutch of eggs in their lives, this variation may be a crucial factor in the long-term survival of the group.

At the Field Museum, Voight is beginning a reassessment of the traditional classification of octopuses into two suborders, a process that is vital to understanding the life history and evolution of these remarkable animals. Octopuses with an internal shell, lateral fins, and filaments (called cirri) along the sucker rows have been grouped in the suborder Cirrata; those lacking these characters, including all the open-ocean species, have constituted the Incirrata — literally, the not-Cirrata. Although the cirrates and the incirrates look like distinct groups, Voight argues that the distinction is suspect because the characters defining the cirrates were present in the ancestor to *all* octopods. Voight has found evidence that the fins, shell, and cirri were lost among the incirrates, and concludes that we simply don't know enough about the group to make meaningful statements about their evolution. With funding from the National Science Foundation, Voight has begun a research program aimed at solving that mystery. Studies of commercial fisheries and marine conservation are dependent on the kind of information Voight is beginning to obtain.



Anna Roosevelt at the 8,000-year-old pottery mound in Taperinha, Brazil, with Carlos Rosario of the Botany Department of the Museo Goeldi, Belem, Brazil, 1988.

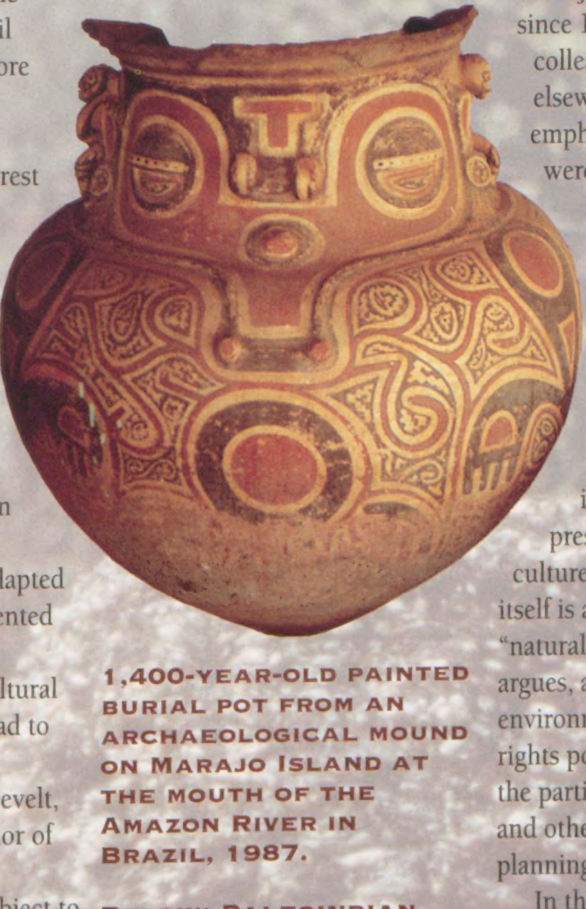
(Inset): 11,000-year-old Paleo-indian rock paintings near cave at Monte Alegre, Brazil, 1991.

Anna C. Roosevelt

AMAZON CULTURES AND COLONIALISM

Most of us who follow environmental news think we know some things about the people and ecology of the Amazon basin that turn out, in light of recent findings by Anna C. Roosevelt, curator of archaeology, to be false or seriously misleading. The region's soil, we've been told, will not support cash crops for more than a season or two once the trees that hold the soil have been cut; therefore the only sustainable economic activity is preservation of the forest and extraction of its natural products. Similarly, we've been led to believe that the indigenous peoples of Amazonia have from time immemorial been nomadic hunter-gatherers, perfectly adapted to the forest but prevented by the poor soil from developing the agricultural surplus that would lead to civilization.

It's true, says Roosevelt, that most of the interior of Amazonia consists of nutrient-poor soils subject to erosion in the absence of trees. But certain areas are in fact arable, and Roosevelt has found that the extensive lowland flood plains supported relatively advanced cultures for thousands of years, culminating in agricultural chiefdoms with sophisticated pottery, handicrafts, and trade that were destroyed by the European conquest in the 17th century. It now appears that aspects of the "traditional" culture of some Indians of the rain forest are actually a recent phenomenon — in some cases, a lifestyle devised by refugees from colonization; in others, a return to lifeways antedating the chiefdoms. The scientific detective work that supports this revisionist anthropology has also turned up prehistoric Amazonian pottery cultures that are at least 1,000 years older than any found elsewhere in the Americas, challenging the conventional understanding of the diffusion of culture in the New World.

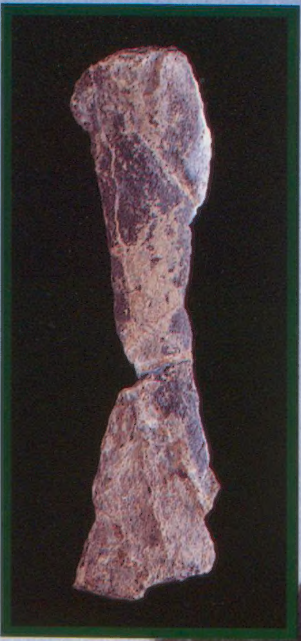


1,400-YEAR-OLD PAINTED BURIAL POT FROM AN ARCHAEOLOGICAL MOUND ON MARAJO ISLAND AT THE MOUTH OF THE AMAZON RIVER IN BRAZIL, 1987.

BELOW: PALEOINDIAN CRYSTAL SPEAR POINT, C. 11,000 YEARS OLD, FROM NEAR SANTAREM, BRAZIL.

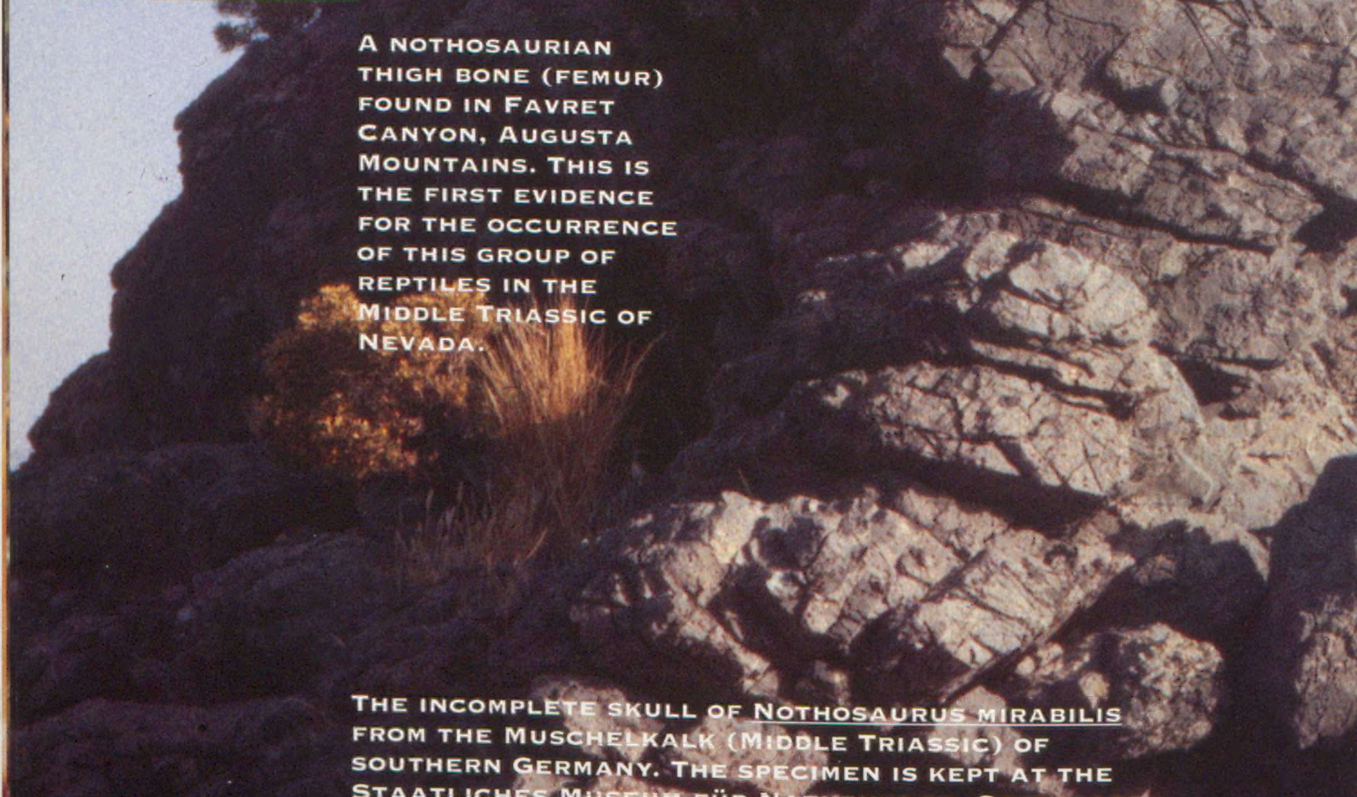
In a series of books and articles appearing in major scientific journals since 1980, Roosevelt and colleagues in Brazil and elsewhere have emphasized that not only were some Amazonian Indians productive agriculturalists, but they introduced to their local ecosystems some exotic plants that have helped make the rain forest what it is today. Neither present-day Indian culture nor the rain forest itself is a completely "natural" phenomenon, she argues, and sound environmental and human-rights policy should include the participation of Indians and other local people in planning for their homeland.

In their glory days, some Indian chiefdoms were home to many thousands of people. Properly cultivated today, the Amazon flood plains could support many more people than do the cattle ranches to which they have largely been given over. Far more fragile are the people and ecosystem of the interior where, Roosevelt says, both ethics and practicality argue for protecting the Indians' lands and culture so they can exercise their genius for using the forest without destroying it.



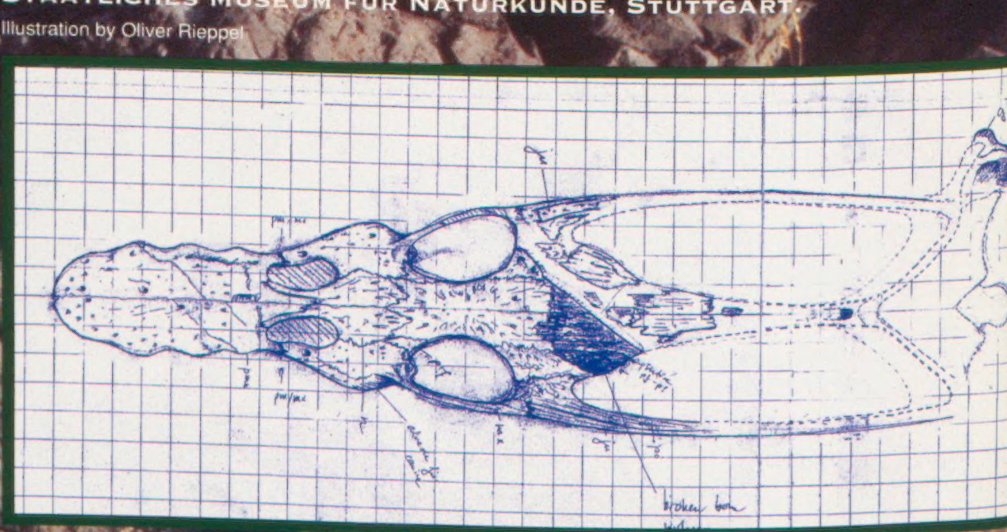
John Weinstein

A NOTHOSAURIAN THIGH BONE (FEMUR) FOUND IN FAVRET CANYON, AUGUSTA MOUNTAINS. THIS IS THE FIRST EVIDENCE FOR THE OCCURRENCE OF THIS GROUP OF REPTILES IN THE MIDDLE TRIASSIC OF NEVADA.



THE INCOMPLETE SKULL OF NOTHOSAURUS MIRABILIS FROM THE MUSCHELKALK (MIDDLE TRIASSIC) OF SOUTHERN GERMANY. THE SPECIMEN IS KEPT AT THE STAATLICHES MUSEUM FÜR NATURKUNDE, STUTTGART.

Illustration by Oliver Rieppel



ROCKS EXPOSED AT FOSSIL HILL, A "TYPE LOCALITY" FOR TRIASSIC MARINE FOSSILS IN NORTHWESTERN NEVADA.

Photo by Oliver Rieppel

SEA CREATURES IN THE DESERT

Olivier C. Rieppel came to the Field Museum in 1990 from the Paleontological Institute and Museum of the University of Zürich. Although he is curator of fossil amphibians and reptiles, Rieppel has done important original work on previously unexplored aspects of the embryology and juvenile development of living reptiles, examining patterns of bone formation in the different groups (turtles, crocodiles, lizards, etc.). Since bone is usually all that is left when animals are fossilized, and since marine reptiles tend to have reduced skeletons in comparison with terrestrial ancestors, understanding the order in which bones appear in the development of living reptiles offers important clues to the proper classification of extinct species and the evolution of the entire class. A 1991 fossil-hunting trip in Nevada turned up the first of what he hopes will be a large number of specimens that will not only help fill in the jigsaw puzzle of reptilian evolution, but answer some questions about their geographical distribution and the shape of the world at the dawn of the Age of Dinosaurs.

While at Zürich, Rieppel had done extensive research on Middle Triassic fossils from Monte San Giorgio in the Swiss canton of Tessin. That region, 220 million years ago, was part of a vast seaway, and the local ichthyosaurs — large, fish-like marine reptiles — shared space with a diversity of marine animals. There were coelacanths and other fishes as well as many reptiles, including a variety of creatures collectively called "nothosaurs." In America, Rieppel began prospecting the desert mountains of Nevada, where ichthyosaur fossils are found in abundance but mainly in association with fossil mollusks, and no other reptiles. This pattern of low biodiversity suggests to paleontologists that the assemblages are the remnants of an open-ocean environment, and Rieppel's question was, Where were the other animals that would be expected in a species-rich coastal environment like that of Monte San Giorgio? Where, in other words, did the mid-Triassic Pacific Coast end up after the heaving Earth produced California and the Rockies?

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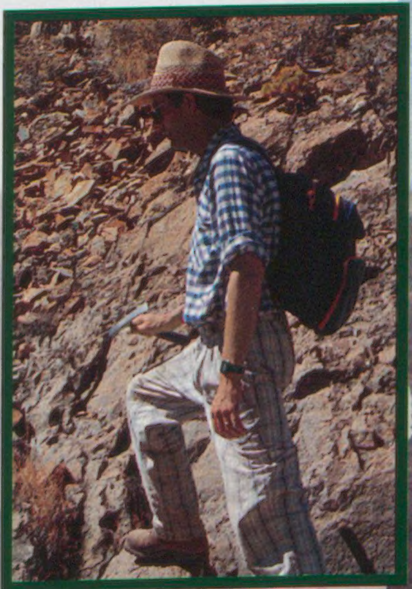

OLIVIER RIEPPEL IN FAVRET CANYON, AUGUSTA MOUNTAINS, NORTHWESTERN NEVADA, 1991.

Rieppel found part of it, at least, on the western slope of Mt. Augusta in Favret Canyon 45 miles north of the Berlin-Ichthyosaur State Park. There, among more ichthyosaur remains, he and his colleagues discovered a fish fossil and the remains of two reptiles — one possibly a thalattosaur and the other a sauropterygian "nothosaur" — all familiar from Monte San Giorgio but either unknown or extremely rare in the U.S. With these discoveries of marine vertebrates and the hope of more to come (an expedition was planned for summer 1993), Favret Canyon becomes one of the most important U.S. sites of Triassic age, a starting point for new knowledge in both biology and geology.

THE DANIEL F. AND ADA L. RICE WILDLIFE RESEARCH STATION HELPS VISITORS DELVE DEEPER INTO BIOLOGY AND CONSERVATION ISSUES.

PART OF THE HORIZON OF THE RIFT VALLEY, AS PORTRAYED IN A MURAL AT THE RICE WILDLIFE RESEARCH STATION.

MESSAGES FROM THE WILDERNESS

Fossil dinosaurs and Egyptian mummies, the relics of extinct species and civilizations, are for much of the public the hallmarks of the Field Museum. But fixed in the popular imagination as those displays may be, most of the work of the Museum is concerned with more recent, and some impending, extinctions. When exhibit developers and curators embarked on a $5.3-million renovation of the animal exhibits, one of the most pressing questions was how to communicate information about the biodiversity crisis in ways that would be both intellectually sound and accessible to visitors of all ages and backgrounds. Part of the solution was "Messages from the Wilderness," the latest installment of the Animal Kingdom exhibits in the Daniel F. and Ada L. Rice Wing.

Using the Museum's classic American mammal dioramas, the Animal Kingdom team, led by senior exhibit developer Debra Moskovits, created a tour through eighteen wilderness park and wildlife reserve settings, from the Arctic Circle to Patagonia in southern Argentina. Each scene has a "ranger station" that describes the habitat in which the animal lives (or lived, since some of them are already extinct and can be observed only in museums) and highlights the unique features that enable particular animals and plants to coexist in a particular ecosystem. A central unit examines human population growth and its effects on the natural resources that humans and all other creatures depend on. The key concept is that it is *entire habitats* that need to be the focus of concern, if we are to avoid a losing battle as individual species face extinction one by one.

"Our main goal," Moskovits has said, "is to help visitors understand and appreciate these dynamic relationships in nature and to be motivated to act responsibly." To that end, several of the ranger stations suggest ways that human economic activity can be modified to protect people's jobs and wildlife habitats alike.

At the same time that "Messages from the Wilderness" opened in November 1992, the Museum opened the Daniel F. and Ada L. Rice Wildlife Research Station, a stunning recreation of a research outpost on Tanzania's Serengeti Plain. Surrounded by acacia trees and dramatically displayed mounts of African wildlife set against a panoramic mural of the Rift Valley, the visitor can delve deeper into the biological science and conservation issues presented by the exhibits. Staffed by Museum educators and specially trained volunteers, the Research Station makes available resources that include computerized databases, a book and magazine library, a laserdisc "juke box" of educational videos, teacher resources, relevant computer games, activity boxes, current newspapers from Africa and other regions where conservation issues are big news, and many other materials for both children and adults.

Photos by John Weinstein

THE BISON AND THE AARDVARK ARE AMONG THE MAMMALS SHOWN IN "MESSAGES FROM THE WILDERNESS."

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